



Chunghwa Picture Tubes, Ltd.

Product Specification

To : SCL
Date : 2011/06/03

TFT LCD
CLAB133UA01

Accepted by:

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Modification Record List

NO.	Issue Date	Modification Index
1	2011/06/03	First version
2		
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1. OVERVIEW

CLAB133UA01 is 13.3" color (16 : 9) TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, LVDS driver ICs, control circuit and backlight. By applying 6 bit digital data, 1600×RGB (3) ×900, 262K-color images are displayed on the 13.3" diagonal screen. General specifications are summarized in the following table :

ITEM	SPECIFICATION
Display Area	293.28(H) x 164.97(V) (mm) (13.3-inch diagonal)
Number of Pixels	1600 x 3 (RGB) x 900
Pixel Pitch	0.1833 (H) x 0.1833 (V) (mm)
Color Pixel Arrangement	RGB vertical stripe
Display Mode	Normally white
Number of Colors	262,144(6bits) (LVDS)
Surface Treatment	AG
Viewing Angle	40° 、 -40° /15° 、 -30° (min.)

2. ABSOLUTE MAXIMUM RATINGS

The following are maximum value, which if exceeded, may cause faulty operation or damage to the unit.

ITEM	SYMBOL	MIN	MAX	UNIT	NOTE
LCD Power Voltage	VCC	0	40	V	
LED Driver Input Voltage	VBL+	7	21	V	
Operation Temperature	T _{op}	0	50	℃	*1),*2),*3),*4).
Storage Temperature	T _{stg}	-25	65	℃	*1),*2),*3).

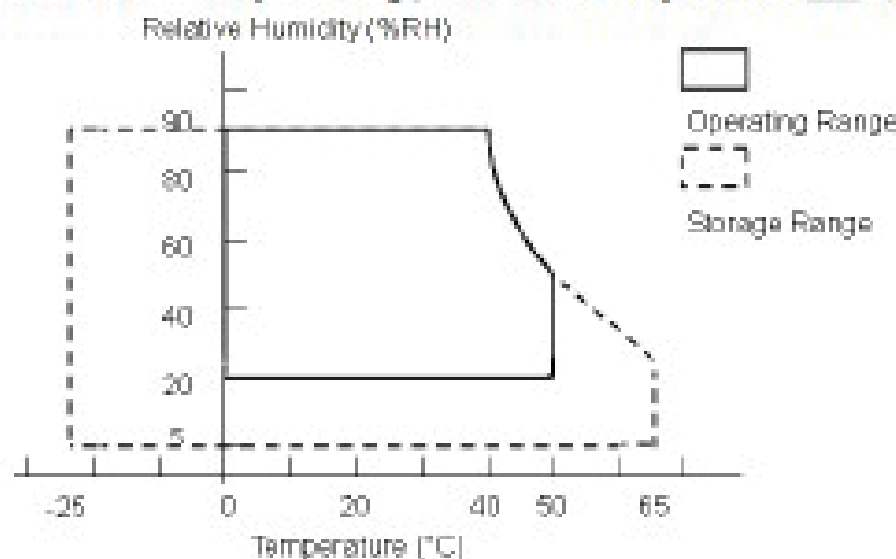
【Note】

*1) The relative temperature and humidity range are as below sketch, 90%RH Max. (T_a ≤ 40℃)

*2) The maximum wet bulb temperature ≤ 39℃ (T_a > 40℃) and without dewing.

*3) If product in environment which over the definition of the relative temperature and humidity out of range too long, it will affect visual of LCD.

*4) If you operate LCD in normal temperature range, the center surface of panel should be under 50℃.



3. ELECTRICAL CHARACTERISTICS

(A) TFT LCD

ITEM		SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LCD Power Voltage		VCC	3.0	3.3	3.6	V	*1)
LCD Power Current		ICC	-	320	420	mA	*2)
Rush Current		Irush	-	-	2	A	*4)
Logic Input Voltage (LVDS: IN+,IN-)	Common Voltage	VCM	1.125	1.25	1.375	V	*3)
	Differential Input Voltage	VID	250	350	450	mV	*3)
	Threshold Voltage (HIGH)	VTH	-	-	100	mV	*3) When VCM = +1.2V
	Threshold Voltage (LOW)	VTL	-100	-	-	mV	

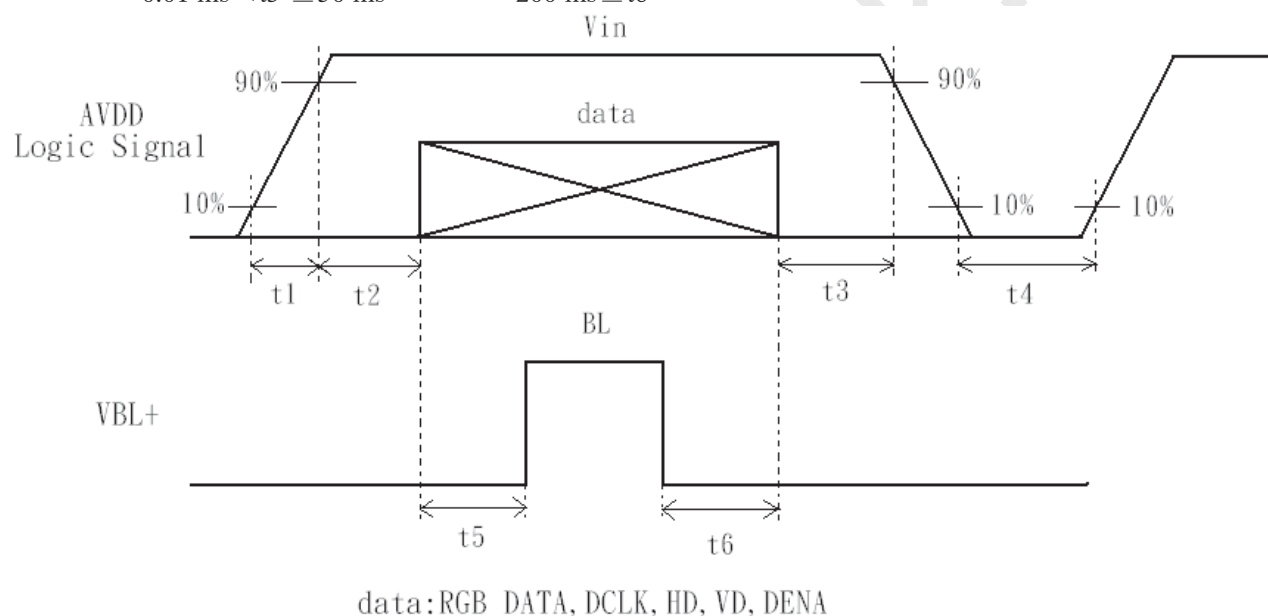
【Note】

*1) Power Sequence :

$$0.50 \text{ ms} \leq t1 \leq 10 \text{ ms} \quad 500 \text{ ms} \leq t4$$

$$0.01 \text{ ms} < t2 \leq 50 \text{ ms} \quad 200 \text{ ms} \leq t5$$

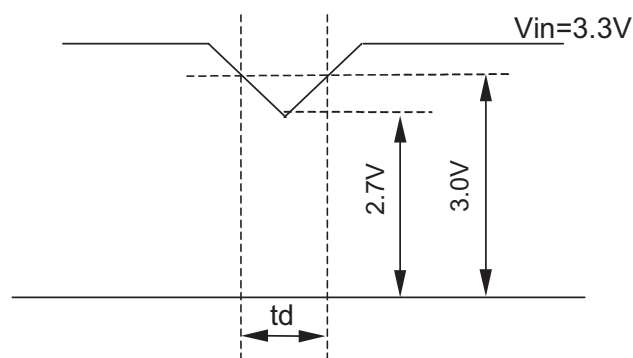
$$0.01 \text{ ms} < t3 \leq 50 \text{ ms} \quad 200 \text{ ms} \leq t6$$



VCC-dip state

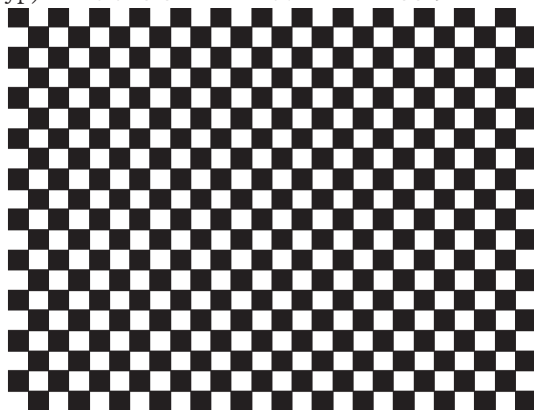
(1) when $3.0\text{V} > \text{VCC} \geq 2.7\text{V}$, $t_d \leq 10 \text{ ms}$.

(2) when $\text{VCC} < 2.7\text{V}$, VCC-dip condition should be as the VCC-turn-off condition.



*2) Typical value is Mosaic (32*36 Checker board) Pattern : 900 line mode.

Circuit condition (Typ) : $VCC=3.3V$, $f_v=60Hz$, $f_H=55.92KHz$, $f_{CLK}=50.1MHz$

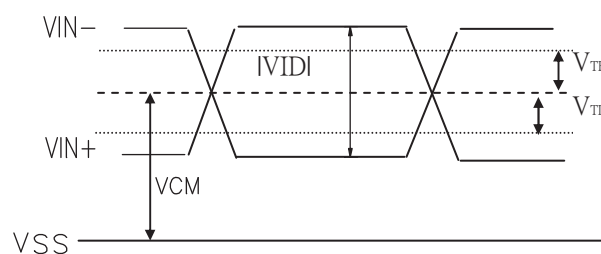
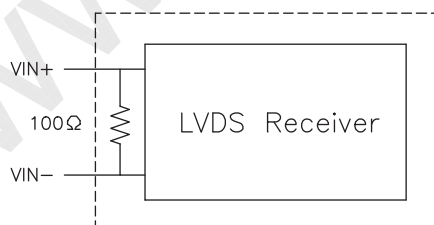


Max value is Black Pattern : 900 line mode.

Circuit condition (Max) : $VCC=3.3V$, $f_v=60Hz$, $f_H=55.92KHz$, $f_{CLK}=50.1MHz$



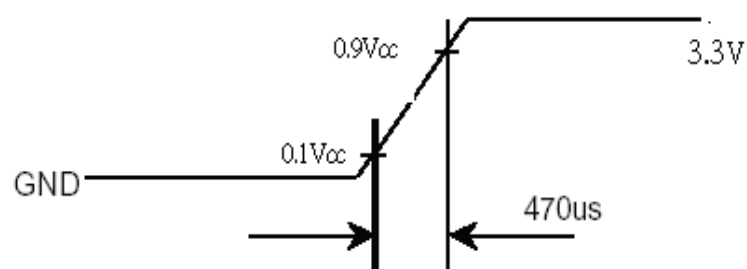
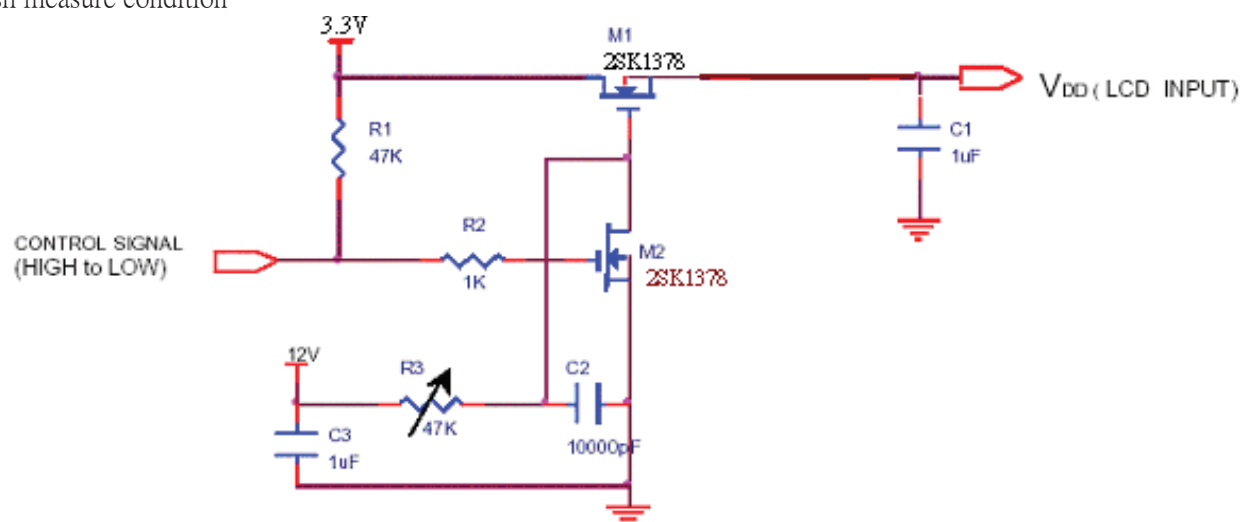
*3) LVDS Signal Definite :



$VIN+$: Positive differential DATA & CLK Input

$VIN-$: Negative differential DATA & CLK Input

*4) Irush measure condition



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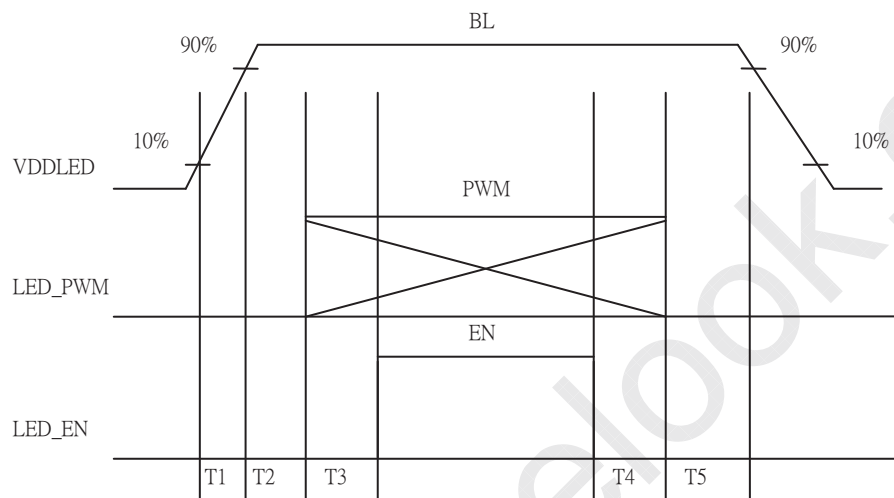
(B) BACK LIGHT

(a.) ELECTRICAL CHARACTERISTICS

Ta=25°C

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LED Driver Input Voltage	VBL+	7	12	21	V	
LED Driver Input Current	IBL+			650	mA	*1)
Forward Voltage	V _F		2.9	3.0	V	*2) I _F =20mA
Forward Current	I _F	19.5	20	20.5	mA	*2)
PWM Frequency	PWM_BL	180	200	1K	Hz	*2)I _F =20mA
Duty ratio	Dim	10		100	%	

(b.) LED ON/OFF Sequence :

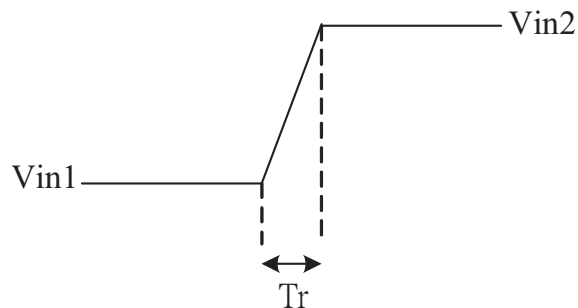


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Note:

The LED power variation spec. is defined as the following figure.



When LED input voltage is
slew rate should be less than

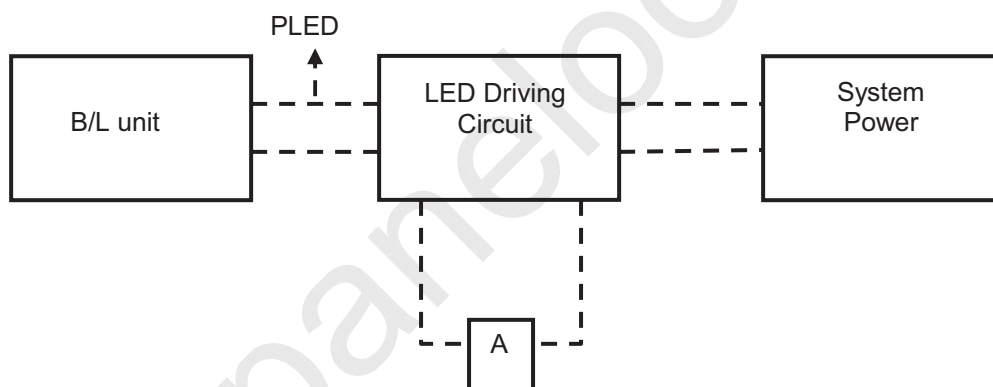
Slew rate = $(V_{in2} - V_{in1}) / T_r$, $V_{in2} > V_{in1}$

from V_{in1} up to V_{in2} , the
20 V/ms.

*1) Maximum LED Driver Input Current at 7V Input Voltage/PWM Duty 100%.

*2) Measure method : a. LED current is measured by utilizing a current meter as show below.

b. System power PLED is measured at input voltage 12V.





4. Connector Interface PIN & Function

CN (Interface signal)

Outlet connector: TYCO_5-2069716-3

Pin No.	SYMBOL	FUNCTION
1	NC	No Connect
2	VDD	Power Supply, 3.3 V (typical)
3	VDD	Power Supply, 3.3 V (typical)
4	V_EEDID	DDC 3.3V power
5	NC	No Connect
6	SCL_EDID	DDC Clock
7	SDA_EDID	DDC Data
8	RXO0-	Minus signal of odd channel 0(LVDS)
9	RXO0+	Plus signal of odd channel 0(LVDS)
10	GND	Ground
11	RXO1-	Minus signal of odd channel 1(LVDS)
12	RXO1+	Plus signal of odd channel 1(LVDS)
13	GND	Ground
14	RXO2-	Minus signal of odd channel 2(LVDS)
15	RXO2+	Plus signal of odd channel 2(LVDS)
16	GND	Ground
17	RXOC-	Minus signal of odd clock channel (LVDS)
18	RXOC+	Plus signal of odd clock channel (LVDS)
19	GND	Ground
20	RXE0-	Minus signal of even channel 0(LVDS)
21	RXE0+	Plus signal of even channel 0(LVDS)
22	GND	Ground
23	RXE1-	Minus signal of even channel 1(LVDS)
24	RXE1+	Plus signal of even channel 1(LVDS)
25	GND	Ground
26	RXE2-	Minus signal of even channel 2(LVDS)
27	RXE2+	Plus signal of even channel 2(LVDS)
28	GND	Ground
29	RXEC-	Minus signal of even clock channel (LVDS)
30	RXEC+	Plus signal of even clock channel (LVDS)
31	VLED_GND	Ground - LED
32	VLED_GND	Ground - LED
33	VLED_GND	Ground - LED
34	NC	No Connect
35	BLIM	System PWM Signal Input (+3.3V Swing)
36	BL_ON	LED enable pin (+3.3V Input)
37	NC	No Connect
38	VDDLED	7V – 21V LED power
39	VDDLED	7V – 21V LED power
40	VDDLED	7V – 21V LED power



(2) CN2 (LED BACKLIGHT)

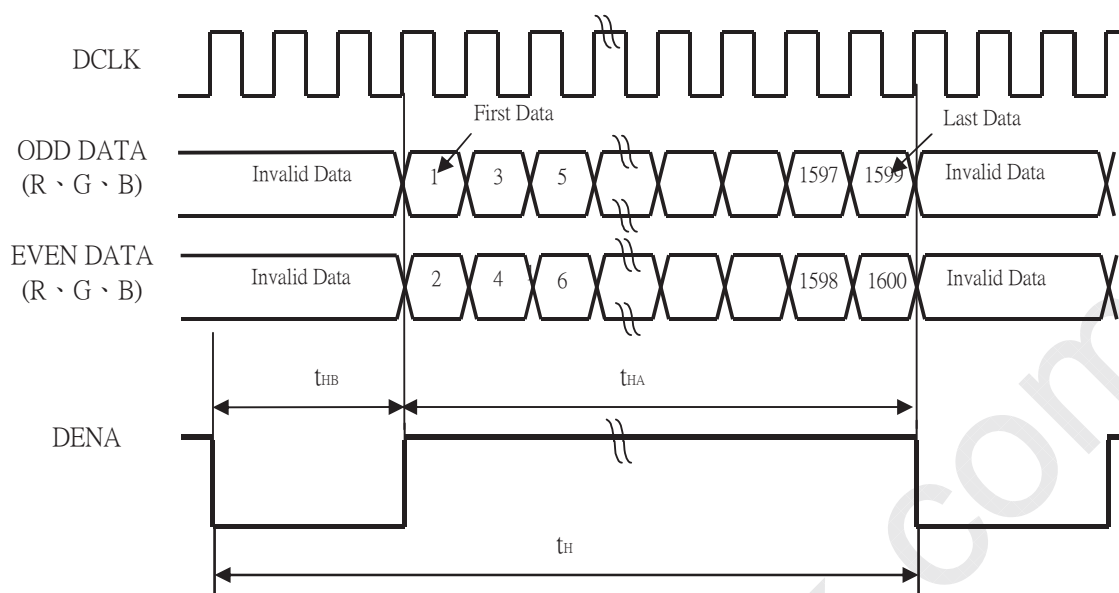
Connector Part NO.: 196149-12041-3 (P2) or equivalent

Pin assignment	Pin	Signal	description
	1	VLED	LED power current supply
	2	VLED	LED power current supply
	3	VLED	LED power current supply
	4	NC	No connection
	5	NC	No connection
	6	NC	No connection
	7	NC	No connection
	8	LED1	LED stream1 current back in.
	9	LED2	LED stream2 current back in.
	10	LED3	LED stream3 current back in.
	11	LED4	LED stream4 current back in.
	12	LED5	LED stream5 current back in.

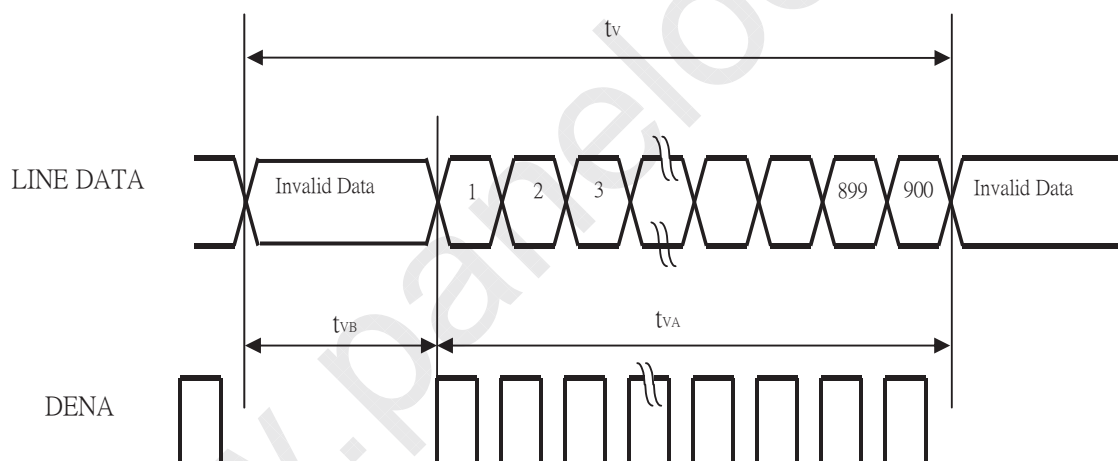
5. INTERFACE TIMING CHART

(1) LVDS input time sequence

(a). Horizontal sequence



(b). Vertical sequence





(2) Timing Chart

ITEM				SYMBOL	MIN	TYP	MAX	UNIT
LCD Timing	Frame Rate			-	55	60	60	Hz
	DCLK		Frequency	f _{CLK}	44.82	50.1	55.49	MHz
			Period	t _{CLK}	18.02	19.96	23.31	ns
	DENA	Horizontal	Horizontal total time	t _H	880	896	986	t _{CLK}
			Horizontal Active time	t _{HA}	800	800	800	t _{CLK}
			Horizontal Blank time	t _{HB}	80	96	186	t _{CLK}
		Vertical	Vertical total time	t _V	926	932	938	t _H
			Vertical Active time	t _{VA}	900	900	900	t _H
			Vertical Blank time	t _{VB}	26	32	38	t _H
LVDS spread spectrum range *3)				-2		2	%	

【Note】

*1) DENA (DATA ENABLE) usually is positive.

*2) During the whole blank period, DCLK should keep input.

*3) LVDS input clock is 85MHz and modulation rate is fixed 100KHz



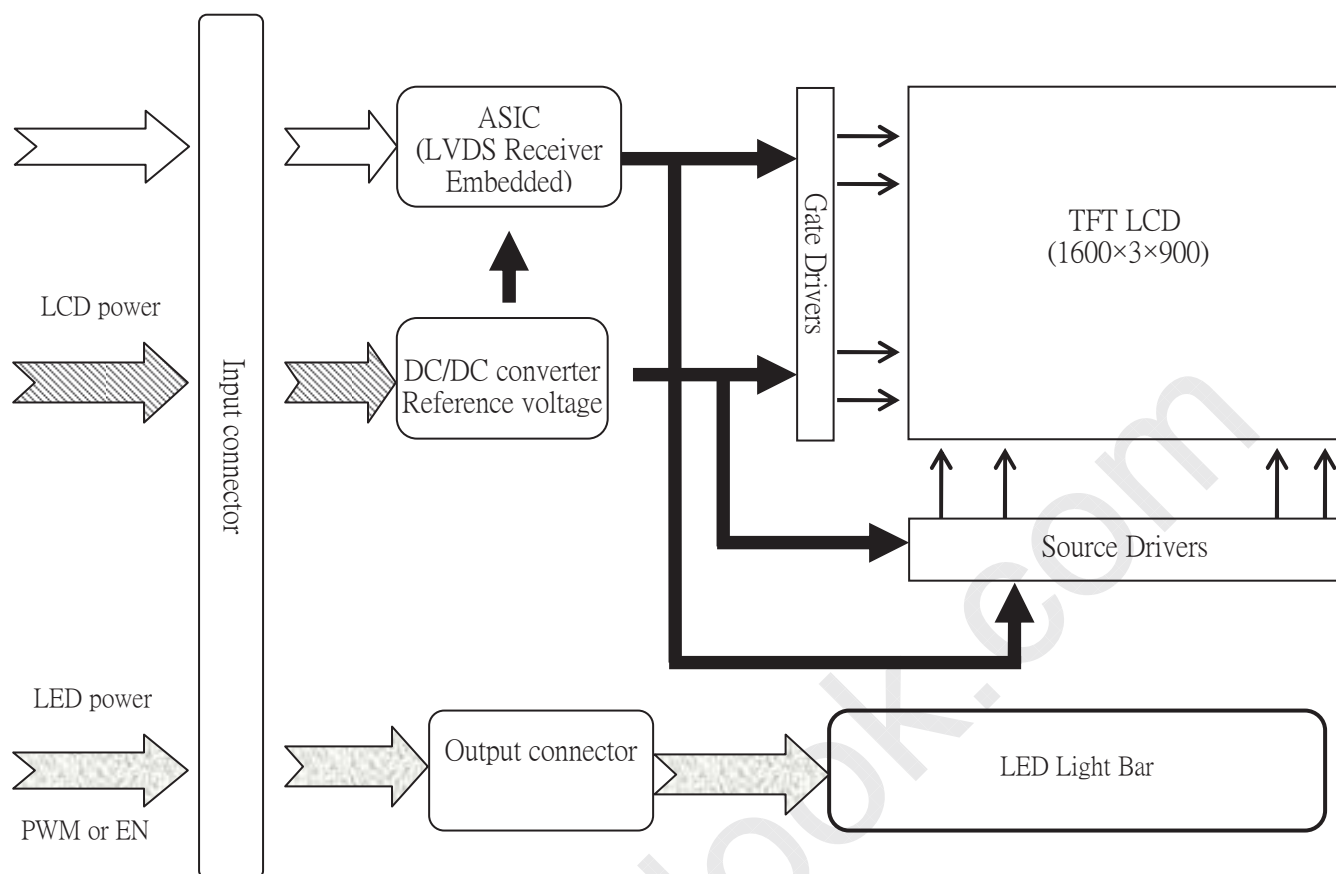
(3) DATA mapping

Color	Input Data	R DATA						G DATA						B DATA					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
		MSB					LSB	MSB					LSB	MSB					LSB
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
RED	RED(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	RED(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Green	Green(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Green(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Blue	Blue(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

【Note】

- 1) Gray level:
Color(n) : n is level order; higher n means brighter level.
- 2) DATA:
1: high , 0: low

6. BLOCK DIAGRAM

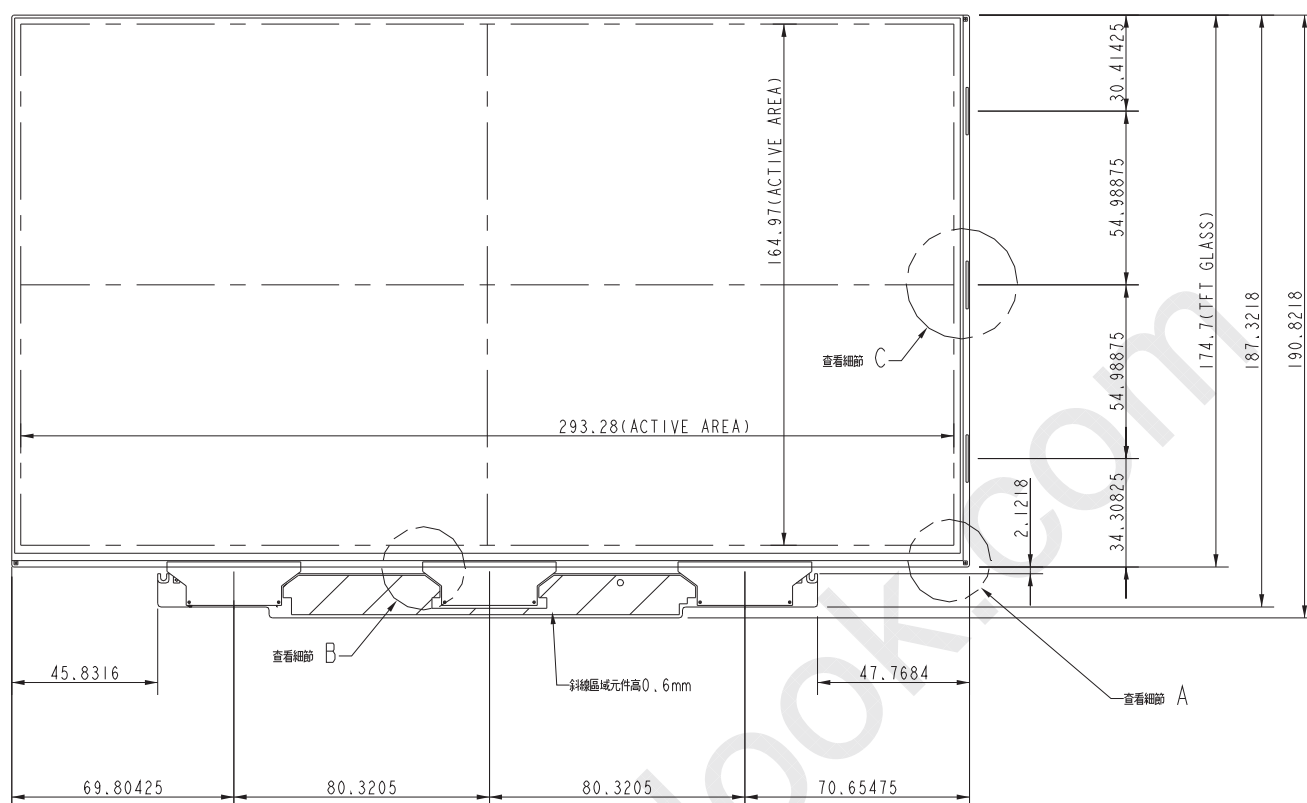


7. MECHANICAL SPECIFICATION

(1) Front side

The tolerance, not show in the figure, is ± 0.5 mm.

[Unit : mm]



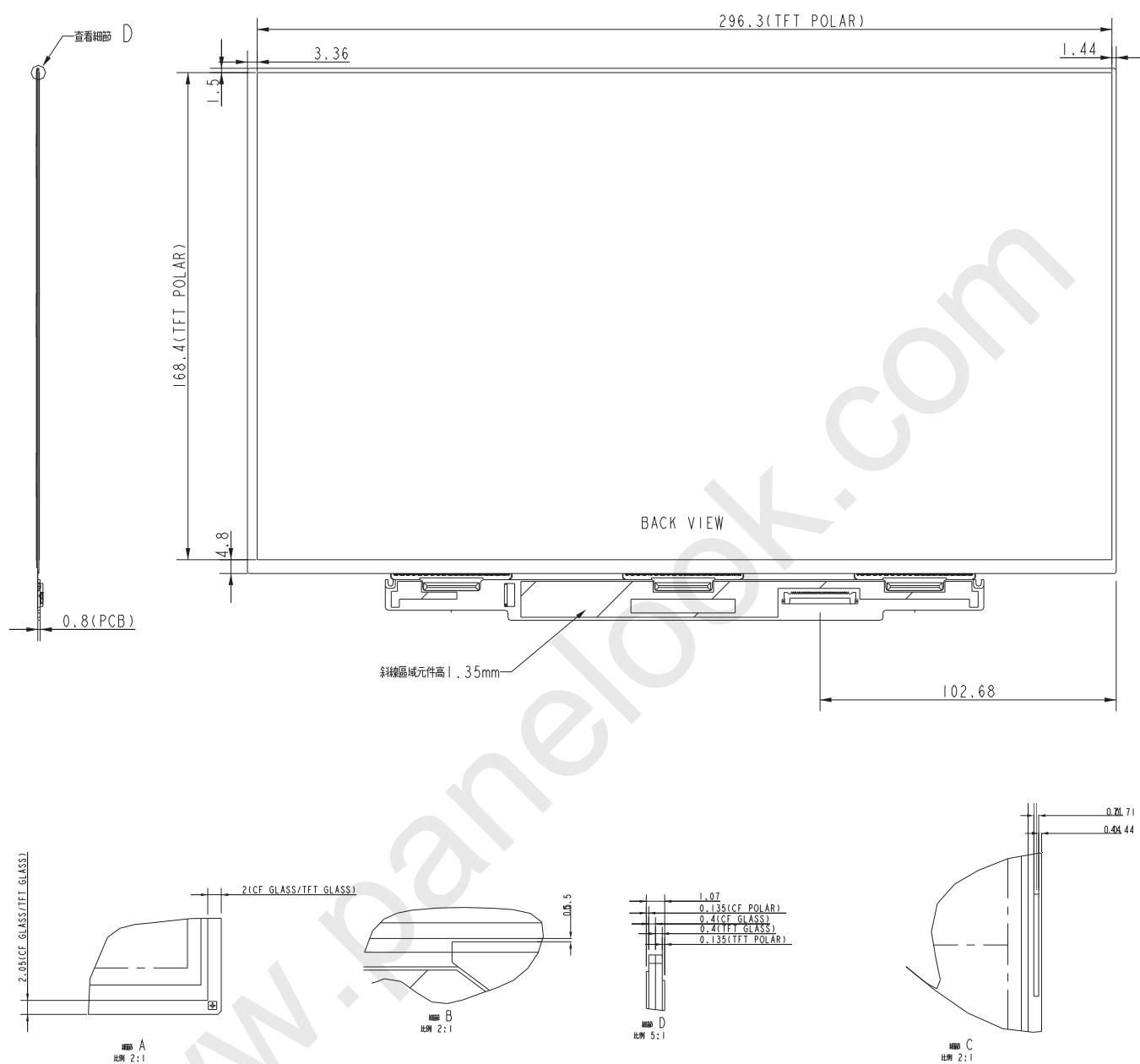
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(2) Rear side

The tolerance, not show in the figure, is ± 0.5 mm.

[Unit : mm]



8. OPTICAL CHARACTERISTICS

Ta=25°C , VDD=3.3V

ITEM		SYMBOL	CONDITION	MIN	TYP	MAX	UNIT	NOTE
Contrast Ratio		CR	$\theta = \psi = 0^\circ$ CPT BLU	400	500		--	*1) 2)
Transmittance (CEN)		T%		5.4%	5.95%		%	*1) 3)
Response Time	Tr		$\theta = \psi = 0^\circ$		6	9	ms	*5)
	Tf		$\theta = \psi = 0^\circ$		10	16	ms	*5)
Cross Talk		CT	$\theta = \psi = 0^\circ$			1	%	*6)
View Angle	Horizontal	ψ	$CR \geq 10$	40/-40			°	*4)
	Vertical	θ		15/-30			°	*4)
Color Temperature Coordinate	W	X	$\theta = \psi = 0^\circ$ CPT BLU	0.293	0.313	0.333		*3)
		Y		0.309	0.329	0.349		
	R	X		(0.538)	(0.586)	(0.598)		
		Y		(0.306)	(0.336)	(0.366)		
	G	X		(0.318)	(0.348)	(0.378)		
		Y		(0.540)	(0.570)	(0.600)		
	B	X		(0.132)	(0.162)	(0.192)		
		Y		(0.091)	(0.121)	(0.153)		

Color coordinate and color gamut are measured by SRUL1R, response time is measured by TRD-100, and all the other items are measured by BM-5A (TOPCON). All these items are measured under the dark room condition (no ambient light).

Measurement Condition: IL= 20mA (each LED)

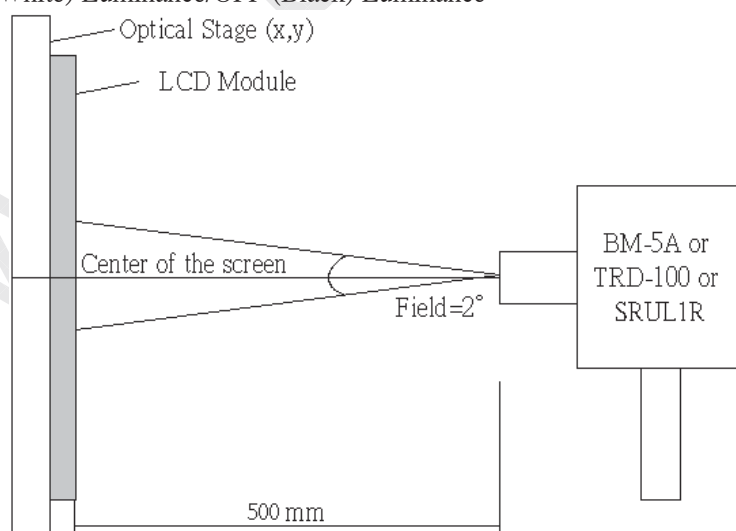
Definition of these measurement items is as follows:

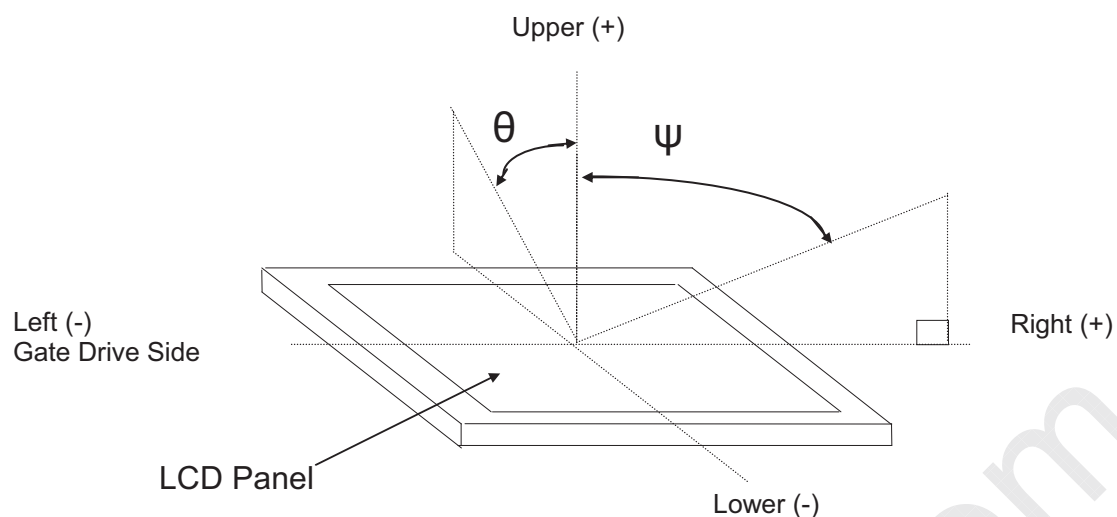
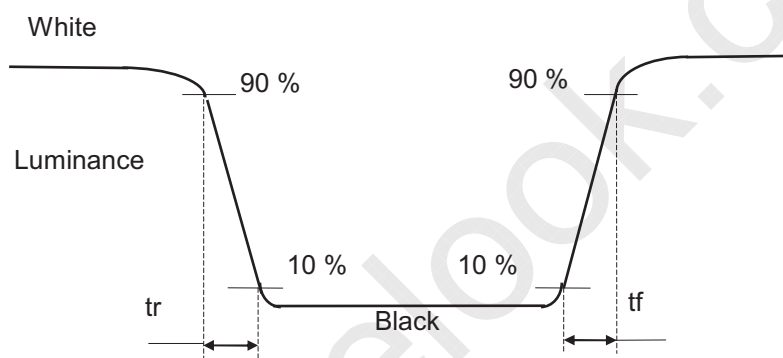
***1) Setup of Measurement Equipment**

The LCD module should be turn-on to a stable luminance level to be reached. The measurement should be executed after lighting Backlight for 20 minutes and in a dark room.

***2) Definition of Contrast Ratio**

CR=ON (White) Luminance/OFF (Black) Luminance



3) Definition of view angle(θ , ψ)**4) Definition of response time*****5) Definition of Transmittance (T%)**

$$\text{Transmittance} = (\text{Luminance of LCD module} / \text{Luminance of backlight}) * 100\%$$